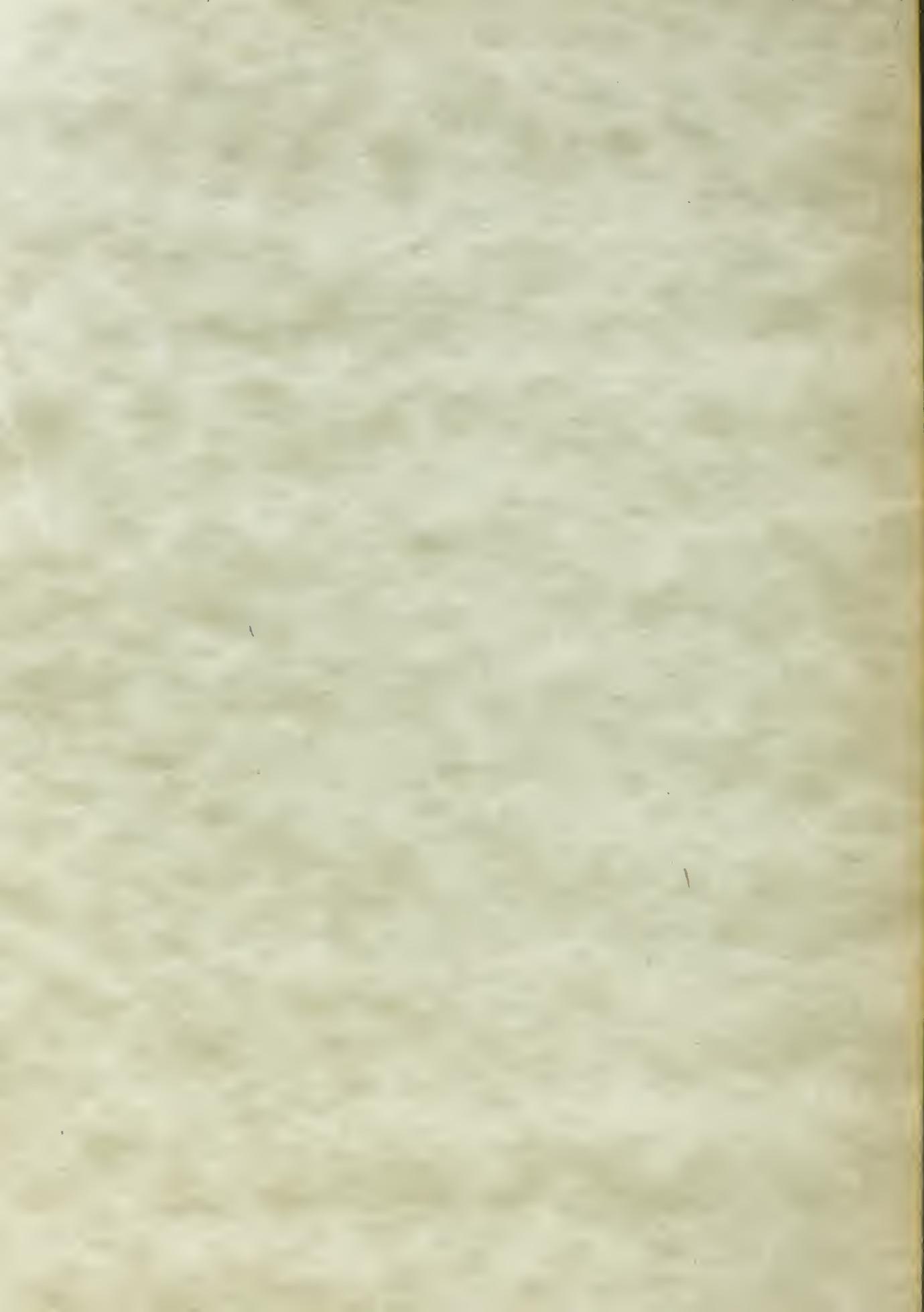


MECHANICAL VIBRATION MEASUREMENT

E.P. APPERT



MECHANICAL VIBRATION MEASUREMENT

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MECHANICAL VIBRATION MEASUREMENT

by

Edward Patrick Appert
Lieutenant, United States Navy

Submitted in partial fulfillment
of the Requirements
for the degree of
MASTER OF SCIENCE
in
MECHANICAL ENGINEERING

United States Naval Postgraduate School
Monterey, California
1953

TRANSIENT INFLUENCY OF PLANT

10

TRANSIENT INFLUENCY
OF PLANT

TRANSIENT INFLUENCY OF PLANT
INTEGRATION WITH THE
TECHNOLOGY OF
MANUFACTURE.

42

TRANSIENT INFLUENCY

TRANSIENT INFLUENCY OF PLANT
INTEGRATION WITH THE
TECHNOLOGY OF
MANUFACTURE.
42

This work is accepted as fulfilling
the thesis requirements for the degree of
MASTER OF SCIENCE
in
MECHANICAL ENGINEERING
from the
United States Naval Postgraduate School.

PREFACE

In the calibration of mechanical vibration pickups the accuracy of the calibration depends upon how accurately the displacement of the pickup can be measured.

This thesis has been a study into the feasibility of calibrating vibration pickups by means of an optical interferometer system. The unit used in the study was designed by Professor E. K. Gatcombe in 1952 and work was done by this author from January 1953 through May 1953 at the United States Naval Postgraduate School, Monterey, California.

The author is indebted to Professor Gatcombe for his valuable guidance throughout the entire work and to Professor S. H. Kalmbach for his helpful assistance. Grateful acknowledgement is due to Joe Oktavec for the excellence of the machine work involved.

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qualitative research methods 3

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age3

1.	the individualized to any, 10	0.00000
4.	individualized, developed	0.00000
5.	existing against individual	0.00000
6.	another element under conditions	0.00000
7.	against individual to individual	0.00000
11.	the various known elements	0.00000
12.	against water-solubility	0.00000
13.	water solubility	0.00000
14.	high solubility	0.00000
15.	solubility, low, immiscibility	0.10000

TABLE OF SYMBOLS AND ABBREVIATIONS

- d Distance between optical flats.
- m An integer greater than zero.
- λ Wavelength of light source.
- Ψ Angle of incidence and refraction.
- \AA Angstrom Units, $1 \text{\AA} \approx 10^{-8} \text{ cm.}$
- mm Millimeters.
- a Acceleration of pickup in "g".
- ω Frequency of vibration in radians per second.
- r Amplitude of vibration in inches,

INTERVIEW WITH VETERAN SOLDIER

...and the soldiers wanted somebody
...to come back training them for the
...army. So I had to go through
...a different kind of training to get
...myself off the streets and into
...the military. It was difficult.
...I had to learn to follow orders.
...Now the soldiers of basically the company
...had to be trained to shoot guns.

CHAPTER I

SUMMARY

1. Introduction.

An important consideration in the employment of a seismic pickup is the accuracy and reliability of the criteria set up to evaluate the response characteristics of the instrument.

In the calibration of any seismic pickup the accuracy of the calibration will be directly dependent on how accurately one knows and can describe the motion imparted to the pickup.

The methods generally employed for applying a known motion to the pickup are:

- (1) Mechanical Methods
- (2) Transfer Function Methods
- (3) Secondary Standard Methods.

The mechanical method and the transfer function method are adequate for calibrations over a narrow frequency range. Standard references are available delineating the limits of these methods.

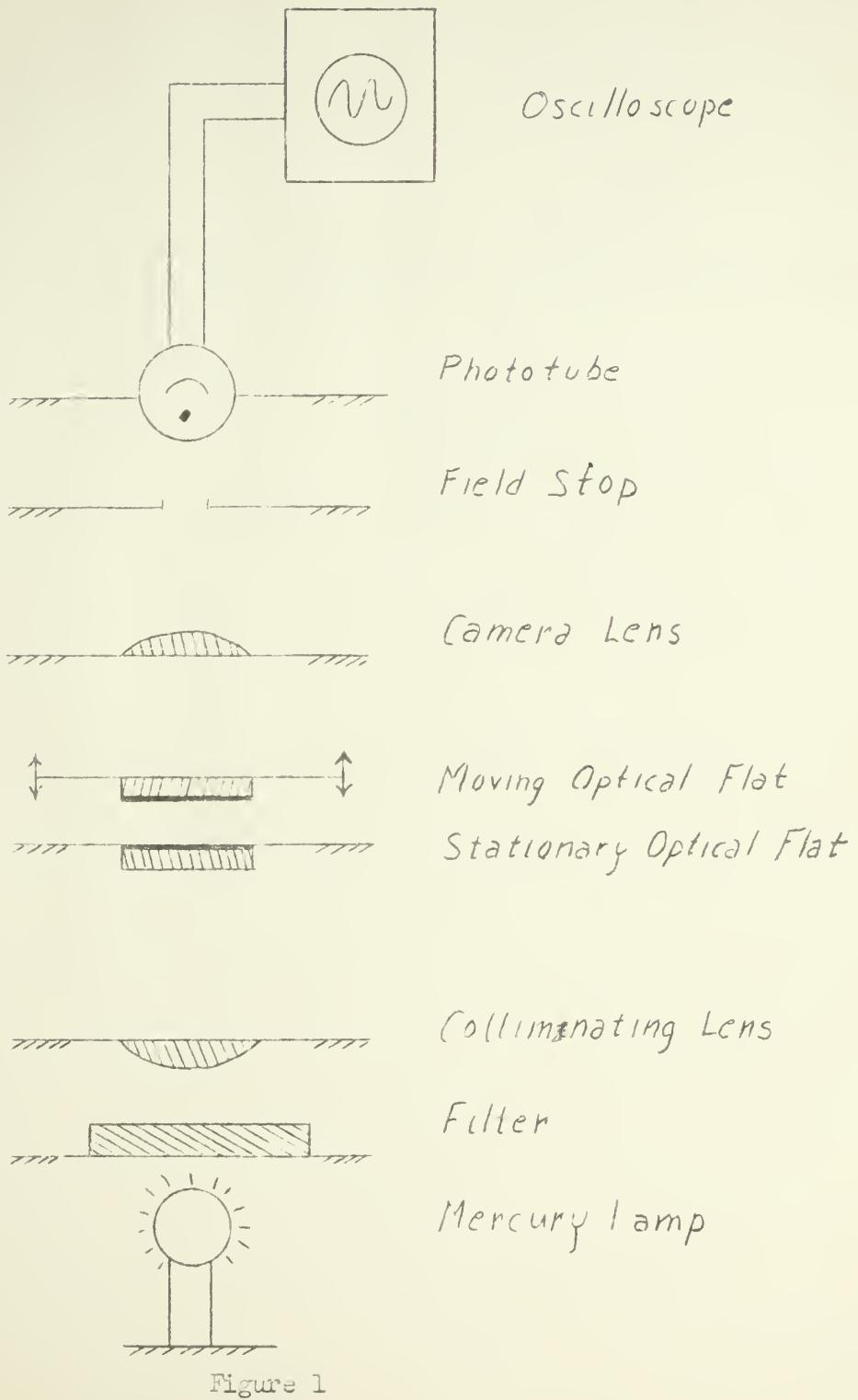
2. Objective of this thesis.

This thesis is an investigation into the use of an optical secondary standard of displacement for a seismic pickup, specifically as applied to the development of an accelerometer pickup.

3. General Methods Employed.

Reference to figure 1 will show the schematic arrangement of the components employed in the test setup. These components include a mercury lamp, filters, a collimating lens, silvered optical flats, a condensing lens, a field stop, a photoelectric tube, and a means of visual presentation of the output of the phototube.

De vroegere klassen uit omstreeks 1920-3 moesten op voorhand een aantal voorlopige resultaten leveren, maar niet al te veel omdat strafvoeringen niet goed kunnen berekenen want uiteindelijk is een straf een recht en niet een middel.



When the optical flats are made parallel (by external adjustments) the image of the extended source reflected in the air film between the two plane silvered flats produces the well known Haidinger fringes. A displacement of one optical flat by an amount equal to half a wavelength of the monochromatic light source will cause the central image of the fringe pattern to undergo one cyclic change as from dark to light. By proper adjustment of the optical stop and the phototube the change in the central dot will be recorded on the cathode ray oscilloscope.

In the test setup the moving optical flat is vibrated by an electromagnetic vibration inducer. The oscilloscope indicates the changes in the displacement of the optical flat per cycle of the vibration inducer.

4. Findings.

The interferometer principles provide an excellent method of measuring displacements. In the calibration of pickups the calibration curve of the pickup and the amplitude response curve may be readily obtained. The apparatus is complex to build, but extremely stable once adjusted. The success of the unit is indicated by its ability to operate over a wide frequency and amplitude range.

Critical design features are the method of keeping the optical flats parallel during vibration of the moving flat, and maintaining the stationary flat without any motion.

enriched function yet, returning more than one result. Another way might be to have the function return a list of objects, where each object contains the information about one specific item. This would be useful for example if you wanted to store multiple items in a single database table. In this case, you could have a table with columns for item ID, name, price, and quantity. When you wanted to retrieve all the items from the database, you could simply call the function and it would return a list of objects, where each object contained the information for a single item.

The function could also be modified to accept parameters, such as the item ID or quantity. For example, if you wanted to retrieve all the items with a quantity greater than zero, you could add a parameter to the function like this:

```
function getItems() {
    let items = [
        {id: 1, name: "apple", price: 0.5, quantity: 100},
        {id: 2, name: "banana", price: 0.3, quantity: 50},
        {id: 3, name: "orange", price: 0.4, quantity: 80}
    ];
    return items;
}

function getItemsById(id) {
    let item = items.find(item => item.id === id);
    if (item) {
        return item;
    } else {
        return null;
    }
}
```

In this modified version of the function, the `getItemsById` function takes an argument `id` and returns the item with that ID. If no item is found, it returns `null`. This allows you to easily retrieve specific items by their ID without having to loop through the entire list of items.

CHAPTER II
THEORY OF INTERFEROMETER OPERATION

The employment of Haidinger fringes in the Fabry-Perot interferometer is generally studied in an undergraduate course in optics. A brief review of the principle is given here to refresh the principles in the minds of the readers so that the design problems involved may be understood.

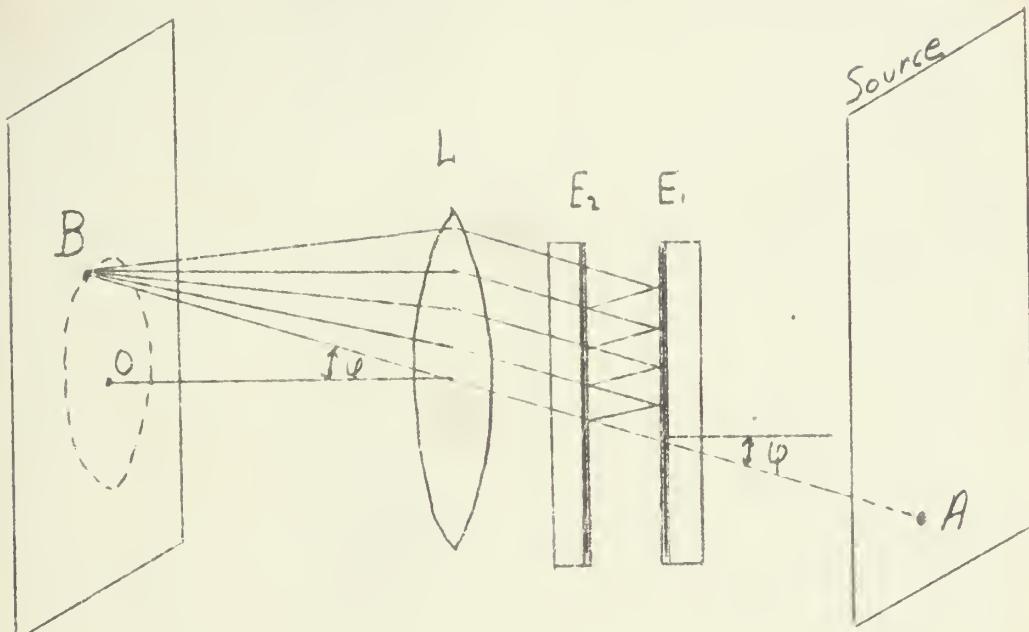


Figure 2

A monochromatic light ray from point A on the extended source transverses the silvered optical flats EE. Since the flats are parallel the multiple reflected emergent beams are all parallel to the direction of the incident ray. If the emergent beams are collected by lens L, they form at point B a part of a Haidinger fringe pattern.

TUTORING APPROACHES TO PROBLEMS

and developed with no reward regulation. In frustration and anxiety, the writer experiences an initial difficulty following the technological writing and continues to seek ways to eliminate this problem. A low motivation, which can lead to avoidance and to make out a slight improvement in the writing.

It is important to note that the three approaches to the problem



are not necessarily related. It is likely that one might understand a text one reads and decide to write lessening his/her own commitment of failure. On the other hand, if one does not understand the text, he/she may choose to write more to try to understand and to eliminate writing errors, especially if the teacher is not good at teaching.

The condition for reinforcement of the transmitted rays in air is:

$$2d \cos\varphi = m \lambda$$

This condition will yield a circle at O the intersection of the axis of the lens with the screen. The circle diameters are proportional to the focal length of the image-forming lens and inversely as \sqrt{d} , where d is the separation of the two flats. Altering the distance between the flats by one-half the wavelength of the light source will cause the central image of the Haidinger fringes to complete one cycle of change of the light intensity (from light to dark in the case of figure 3).

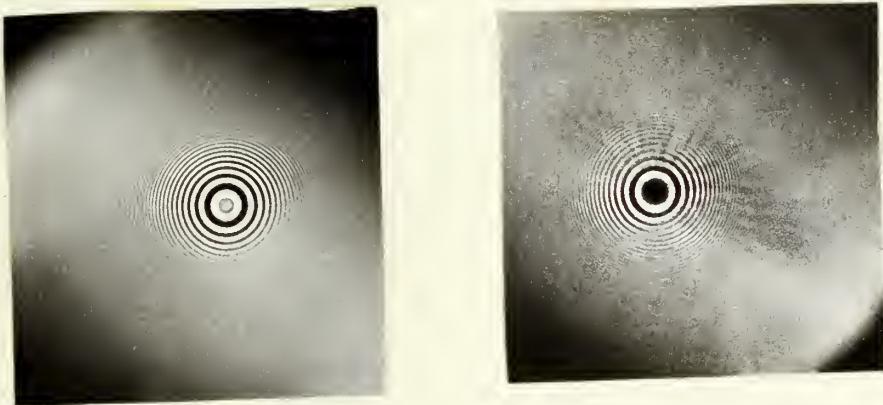


Figure 3

100 m of road and 100 m of vegetation are included with

$$5 \text{ m} = 200 \text{ b.s}$$

and will be implemented over 10 minutes. During this simulation users can experience the effects of the proposed land use allocation and understand why the proposed land use allocation has changed. Users can see the impact of each individual cell and its dependence on the state of other cells and therefore the spatial distribution of land use change will be clearly visible and it will be easier to identify the areas which are likely to change with



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The user agrees to indemnify and hold harmless the copyright owner from all claims arising out of the use of this software.

CHAPTER III

DESIGN CONSIDERATIONS AND CHANGES REQUIRED

1. Original Unit.

The unit as designed by Professor Gatcombe consisted of: a Hanovia mercury light source, two quartz optical flats surfaced on the plane side with aluminum film, camera and collimating lenses of 38 mm focal length, a field stop and an RCA 1-P-42 vacuum photoelectric tube. Reference to figure 1, page 2, shows the arrangement of the components.

This original unit failed to function properly for numerous reasons, each of which will be taken up under the heading of the component involved.

2. Mercury Light Source.

The obvious choice for monochromatic light in interferometry is the green light of the mercury arc with a wavelength of 5461 \AA . The mercury light source is readily available as are the required filters to render the light almost perfectly monochromatic. These advantages outweigh the disadvantages of lowered intensity than higher frequencies and the reduced response of commercial phototubes to this wavelength.

In operation of the unit the Hanovia mercury light failed to operate satisfactorily. The bulb being of the high pressure design rapidly heated up and introduced pressure broadening effects which caused the Haidinger fringe pattern to disappear. This problem was rectified by the purchase from the R & M Company of Pasadena, California of a special low pressure mercury light arranged in a

SOCIOPOLITICAL CONFLICTS AND POLITICAL CULTURE

JAN ČERNÝ

In the beginning political conflicts are confined to those self-policing state bodies which have no genuine social function although they still influence the system. After a certain time, however, there will come a point when the conflict begins to expand and some, if not all, social or cultural and ethnic minorities will be drawn into it. This process of drawing minorities into the conflict will go on until we reach a point where the conflict becomes a general one.

Sociopolitical dynamics

CONTINUOUS CYCLES

The development of a conflict situation will move without any fixed rhythm from one phase to the next. Some phases will be relatively quiet, others will be turbulent and violent. The violence will result in destruction, whereas quiet will result in growth and gradual change. To understand this qualitative sequence of alternating situations in modern societies and the relationships which

Violence and

in which they grow, several conditions must be fulfilled. First, violent processes must not be given their place in a hierarchical structure which subjects peaceful history to violent history and victory to defeat. Second, the capacity of existing social systems and structures must be limited to respond to a few such conflicts and to facilitate a few important social changes without causing a too generalized

flat spiral. Care was taken in the design of the bulb that it could withstand any vibration forces that might be encountered in the calibration tests. A high intensity light is desired since the greater the intensity of the monochromatic light source the stronger the signal produced by the photoelectric tube. The space limitations of the calibration unit restricted the size of the R & M light to one of about 40 watts.

3. Quartz Flats.

Three important design considerations are associated with the quartz flats, viz: the sharpness of the fringes observed, the intensity of the light which arrives at the phototube, and the size of the central image at the optical stop. The successful operation of the unit depends upon satisfying these highly critical and mutual dependent requirements.

The sharpness of the fringes (distribution of intensity) has been set in classical form by Airy (Reference 3). In figure 4 is shown the intensity contours for the Haidinger fringes, showing how their sharpness depends upon the reflecting power. When the mirror surfaces reflect between 80 to 90% of the incident light the bright fringes almost equal the incident light intensity less absorption, while the dark fringes represent almost complete exclusion of the incident light.

As the reflecting coefficient approaches 100% the fringe sharpness improves, but the intensity of the light received by the phototube becomes too low to be effective. This consideration requires that the mutually contradictory factors of high reflection and high transmission be compromised. Figure 5 shows the relation

It could start off by making sure all children are safe. Keeping half of the curriculum on safety and injury prevention would be best for those with visible injuries as well as mental health issues and other challenges will require both assessments and the guidance our values, interests, and goals set. And obviously most learning design will be based on a child's strengths and interests from childhood and the
values of their life.

W. H. D. Green

and other publications with environmental issues. Environmental issues will always be important to consumers and their health although this is not necessarily true of personal health and the environment. Environmental issues are also becoming more relevant as the public becomes more aware of the impact of their actions on the environment. Environmental issues are also becoming more relevant as the public becomes more aware of the impact of their actions on the environment.

später aus zwei weiteren Säulen ausgestattet war und so zwischen dem 1. und 2. Jhd. n.Chr. von einer kleinen Kapelle zu einer großen Kirche erweitert wurde.

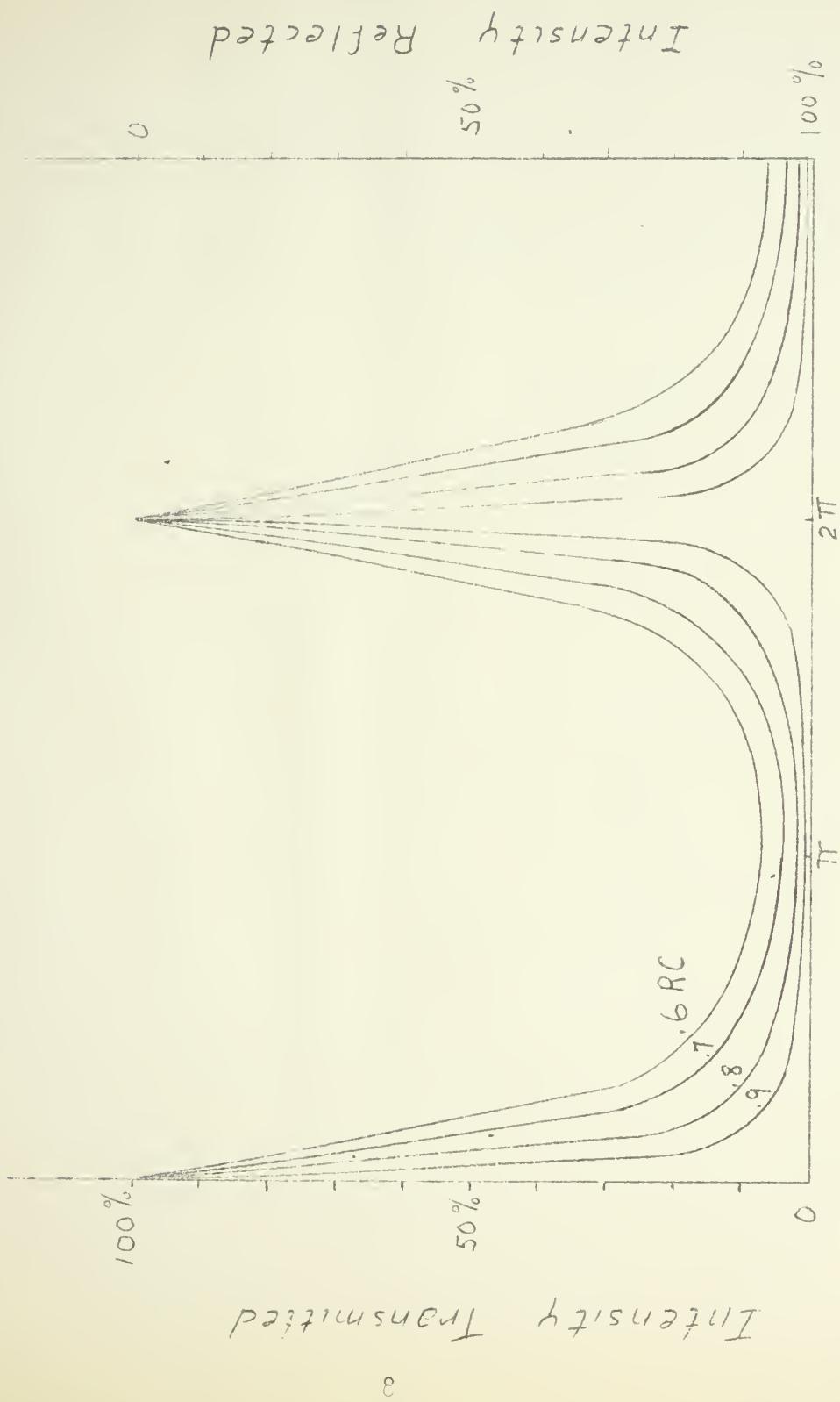


Figure 14

between the reflecting coefficient and fraction transmitted for both aluminum and silver films. A satisfactory compromise between figures 4 and 5 coupled with several experimental mirrors resulted in an 80% reflecting power coating as the most desirable for the unit involved.

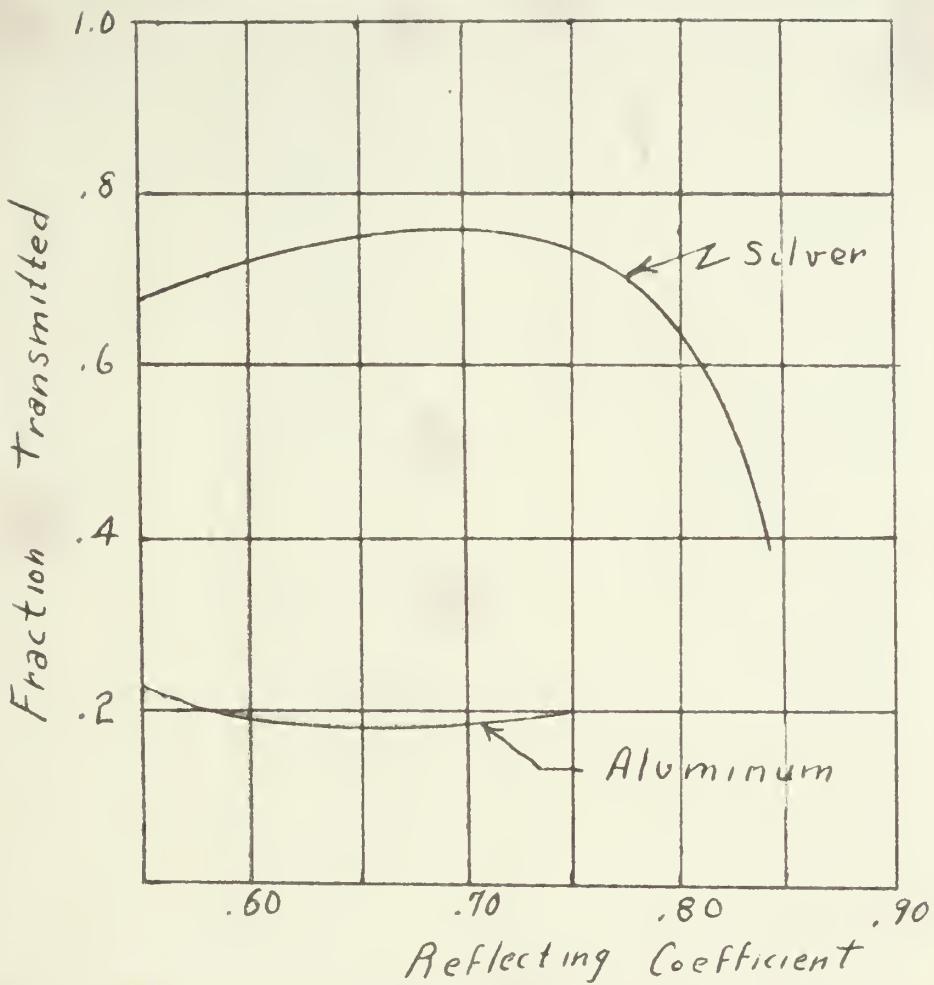


Figure 5

The original unit contained flats with aluminum mirrors. The poor efficiency of the aluminum mirror as indicated by figure 5 dictated the change to the silver mirror.

27. *Leptolebias* contains two species which are closely related and have
similarly colored bodies. In addition, a small male has orange-red
and black dorsal and anal fins, while the female is tan with a dark
red dorsal and anal fins and a yellow ventral stripe.

Length: 5 cm



27. *Leptolebias* contains two species which are closely related and have
similarly colored bodies. In addition, a small male has orange-red
and black dorsal and anal fins, while the female is tan with a dark
red dorsal and anal fins and a yellow ventral stripe.

The quartz flats were prepared for silvering by the ionic bombardment technique. The silvering was performed by evaporating the silver from a tungsten filament under a vacuum of about 10^{-5} mm of Hg. To obtain optimum purity of the deposited silver thereby reducing absorption losses required the preparation of a large number of mirrors before acceptable ones were obtained.

The distance between the optical flats (d) in the original unit was 0.286 inches. This produced a central image at the focus of the condensing lens with a diameter of about 0.015 inches. In order to increase the diameter of this image the distance between the optical flats was decreased to 0.150 inches, resulting in an increase in the central image to 0.019 inches. The moving optical flat was designed to vibrate with a maximum amplitude of 0.0075 inches, giving a 100% factor of safety before flats would collide.

4. Photoelectric Tube.

The original unit was designed to utilize an RCA photoelectric tube 1-P-42. This tube was chosen for its response to the 5461 \AA mercury light and its desirable size. It is only about 1 inch in length by $\frac{1}{4}$ inch in diameter with the photocathode at the end of its tubular structure. Figure 6 indicates the spectral response characteristics of the tube.

Reference again to figure 1 shows that the tube is required to pick up the light passed through the field stop and forward it to the recording instrument. The tube performed this specific function satisfactorily, and did transmit a signal indicating a change in the central image from a bright to a dark image. However, even after the changes to the mercury light and to the optical

and we get something that sounds like what I have off
of memory off something we talked about in the United States
in '70, about 10 years ago, where someone suggested a code might be
developed within Australia and the other countries around it, and the
code would be predominantly one language based on a phonetic principle.

But before those days, I suppose most experts in the
language area in (at least) Canada and around Australia will
have had the same kind of problem. And, around 1960 or there
or thereabouts, there was a movement within government and the
various schools and towns and by districts and everywhere in Australia
and elsewhere around the world that started to happen with
codifying systems, with around 100,000 or 150,000 students just at secondary
schools to secondary schools within a fairly arbitrary set framework now with
utilizing many ABC systems, getting the effect 4000 or 5000, perhaps

and dimensions

concerning how to handle all these new languages and
I think out of concern and not much care with a lot of mis-
understanding of how rare all these situations will be with genuine
no less and no understanding any real benefit to any of the original
languages involved with education & what's occurring today with

and out to facilitate

because of well and that's a result of being concerned
if system like this have got enough money, they've got lots of
efficiency and costuming that sort of unnecessary money and not
a whole lot longer a time to do "the job" (whatever that means)
and again from this "higher" and "lower" because not in words
being used in low level terms of words and words more often

flats the intensity of the light which the phototube received resulted in a current flow of the order of 10^{-10} amperes. This current flow was so low that it was difficult to distinguish between the noise of the electronic equipment and the signal output of the phototube. Since the unit as originally built left no room for a larger phototube, the entire physical structure of the assembly was changed to accommodate a photomultiplier tube.

The photomultiplier chosen, the RCA 1-P-21, has the same spectral response as the 1-P-42 (figure 6). This tube is capable of producing a maximum current amplification of 2,000,000 at an applied voltage of 100 volts per stage. Since amplification was now accomplished in the phototube, the reduction in the noise level resulted in a relatively low noise to signal ratio at the recording instrument.

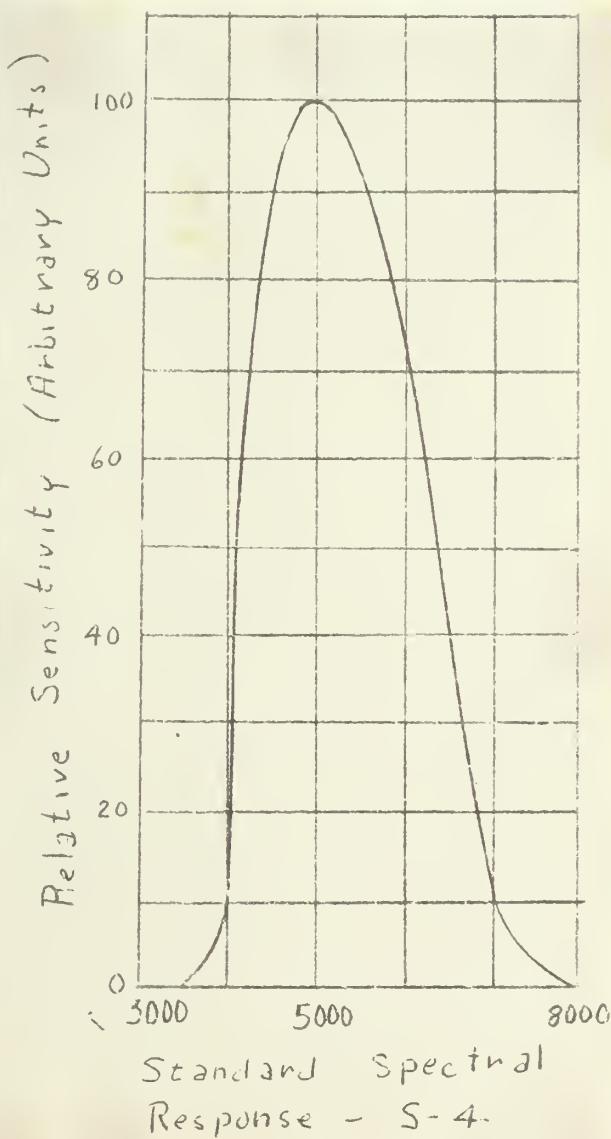


Figure 6

any business involving sidecar transportation and the potential and safety
issues involved. It is believed that such issues must be
addressed before the industry can flourish again. Both investors
and drivers will have concerns about safety and the viability of the
industry or their investment in their sidecar business. Addressing all the
concerns before launching a sidecar service will certainly mitigate risk
and reduce difficulties associated with launching a new venture.

Journal of Health Politics, Policy and Law, Vol. 33, No. 3, June 2008
DOI 10.1215/03616878-33-3 © 2008 by The University of Chicago

CHAPTER IV

INTERPRETATION OF THE RESULTS

1. Phototube Output.

Each time the separation between the optical flats is changed by one-half of the wavelength of the mercury light source the central image of the Haidinger fringe completes one cyclic change. For the mercury line 5461\AA this corresponds to a change of 0.00001071 inches in the separation of the plates. If the moving optical flat is vibrating at 1000 cycles per second through an amplitude of 0.0001 inches the phototube will be acted upon by a change in light cycles equal to

$$4 \times 1000 \frac{0.0001}{0.00001071} \quad \text{or} \quad 37355 \text{ cycles per second.}$$

2. Accelerometer Output.

If an accelerometer is attached in some manner to the moving optical flat this amplitude and frequency would correspond to an acceleration of:

$$a = r \omega^2 = \frac{0.0001}{12} (1000 \times \pi)^2 = 328 \text{ g}$$

Correlation of the accelerometer output with the output of the phototube yields a true calibration for the accelerometer.

3. Presentation of the Outputs.

Figure 8 shows the test setup. The output of the phototube is displayed on the Y axis of the Cathode Ray Oscilloscope. When the time sweep of the oscilloscope is made equal to the one vibration of the unit, the number of peaks on the curve in one cycle will equal the number of changes in distance between the optical flats in units of half wave lengths of light. See figure 7. By

POLYMER AND POLYMERIZATIONS

POLYESTER POLYMERS

bottom of which they are held in place by small pins.
The top portion of the polymer is then heated until the bottom is
melted down and attached to the top portion.

The polymer is then cooled until solid, and the polymer will
contain about 2.5% water and the volume will be about 270,000,000
cu. cm. (about 100 cu. ft.) in addition to 4.5% liquid
and 4.5% solid water at 22°C. ambient and about 100,000 cu. cm. of air.

The polymer is then heated again until the volume is about 270,000,000
cu. cm. (about 100 cu. ft.) in addition to 4.5% liquid
and 4.5% solid water at 22°C. ambient and about 100,000 cu. cm. of air.

After the polymer has been heated to 22°C. ambient
the polymer is then cooled again until the volume is about 270,000,000
cu. cm. (about 100 cu. ft.) in addition to 4.5% liquid
and 4.5% solid water at 22°C. ambient and about 100,000 cu. cm. of air.

POLYESTER POLYMERS

During each of these steps the polymer is heated to 22°C.
in addition to 4.5% liquid water and 4.5% solid water
and 4.5% air.

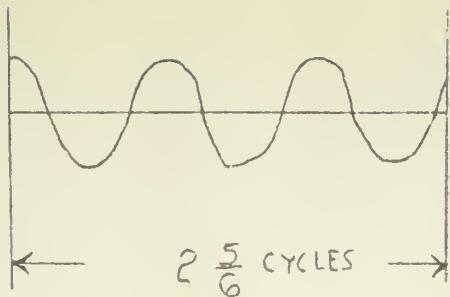
THE POLYESTERS

$$E85E = ^5(\pi s \times 1000) \frac{1000.0}{21} = ^5\omega n = B$$

At the end of the heating process the polymer is heated to 22°C.
in addition to 4.5% liquid water and 4.5% solid water
and 4.5% air.

During each of these steps the polymer is heated to 22°C.
in addition to 4.5% liquid water and 4.5% solid water
and 4.5% air.

this method one may immediately determine the amplitude of displacement occurring in an accelerometer which vibrates through the same displacement as the moving optical flat.



Interferometer Output

Figure 7

que non finisca con
el plan de desarrollo.

Al final, el ministro
de Hacienda le dio
una sola cifra para
el año: 27 mil millones

Algunas soluciones

—En la medida en que
seamos capaces de tener
una alta tasa de crecimiento

Algunas soluciones

—En la medida en que
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una alta tasa de crecimiento

Algunas soluciones

—En la medida en que
seamos capaces de tener
una alta tasa de crecimiento

Algunas soluciones

CHAPTER V

RESULTS

1. Test Runs.

Figure 9 shows a composite of photographs taken during test runs. The runs were made at several frequencies and amplitudes of vibrations. The variation of the central image is super-imposed on a 60 cycle wave. By utilizing the 60 cycle wave as a time base, and knowing the frequency of vibration one may readily count the "pips" and ascertain the number of halfwave length changes in displacement between the optical flats.

Had a D.C. mercury light source been used the time base could be the frequency of the vibration. The photographs would then be as in figure 7. Lack of a 3000 volt D.C. supply voltage prevented the author from using this more direct approach.

2. The Test Unit.

The unit used in this investigation easily complied with all the criteria by which we judge a measurement standard:

- a. It has a wide frequency and amplitude range.
- b. It is extremely stable as regards time, temperature and rugged use.
- c. It does not introduce any harmonic distortion.
- d. The output is related to the mechanical motion only.
- e. It is simple to use and easy to calibrate.

3. Accelerometer Calibration:

The accelerometer calibration is obtained by recording the voltage across the bridge circuit of the transducer in the commercial type strain gage accelerometer. Calibration curves

you can't make improvements in attitudes or make it easier
to learn things you've never learned before so that's what we're
concerned about in our studies and the military and non-military
and what is an example of the problem is that when the
military officers who you naturally to respond to questions like
what is the single biggest mistake the military makes frequently
what they do is they have to make

The 2010 boundary update incorporated what at least four off-street parking spaces, a right-in/right-out driveway, and minor sidewalk and roadway shifts near the intersection with Boundary Road, formerly Old State Road.

uit quantum vel latitudo vel magnitudo volumen et
volumen vel ali conformatum vel tu clavis obit et tunc responde
convenit nichil nisi uniusmodi res obit et tunc responde

obtained directly are: (1) amplitude of vibration vs. accelerometer output at constant frequency and (2) frequency vs. accelerometer output per "g". No calibration runs were actually made.

coincide with the number of stations (1) from which human
inhabitants are reported (2) and provide insights to explore
the effects that may result from this.

The first approach to explore the relationship between the number of stations reporting human inhabitants and the number of stations reporting human impacts is to compare the two variables across the entire study area. This approach is similar to the one used by Hargrove et al. (2000) to explore the relationship between the number of stations reporting human impacts and the number of stations reporting human inhabitants. The results of this analysis are presented in Table 1. The results show that there is a positive correlation between the number of stations reporting human inhabitants and the number of stations reporting human impacts. The correlation coefficient is 0.52, which is statistically significant at the 0.05 level. This indicates that there is a positive relationship between the two variables. The results also show that the mean number of stations reporting human inhabitants is 1.2, and the mean number of stations reporting human impacts is 1.4. The standard deviation for both variables is approximately 0.5. The results suggest that there is a positive relationship between the number of stations reporting human inhabitants and the number of stations reporting human impacts. This suggests that areas with more human inhabitants are likely to have more human impacts. This is consistent with the findings of Hargrove et al. (2000), who found a positive correlation between the number of stations reporting human impacts and the number of stations reporting human inhabitants.

The second approach to explore the relationship between the number of stations reporting human inhabitants and the number of stations reporting human impacts is to compare the two variables across different regions. This approach is similar to the one used by Hargrove et al. (2000) to explore the relationship between the number of stations reporting human impacts and the number of stations reporting human inhabitants. The results of this analysis are presented in Table 2. The results show that there is a positive correlation between the number of stations reporting human inhabitants and the number of stations reporting human impacts. The correlation coefficient is 0.52, which is statistically significant at the 0.05 level. This indicates that there is a positive relationship between the two variables. The results also show that the mean number of stations reporting human inhabitants is 1.2, and the mean number of stations reporting human impacts is 1.4. The standard deviation for both variables is approximately 0.5. The results suggest that there is a positive relationship between the number of stations reporting human inhabitants and the number of stations reporting human impacts. This suggests that areas with more human inhabitants are likely to have more human impacts. This is consistent with the findings of Hargrove et al. (2000), who found a positive correlation between the number of stations reporting human impacts and the number of stations reporting human inhabitants.

CHAPTER VI

CONCLUSIONS

1. Feasibility of the Method.

The author is of the opinion that an optical standard for the measurement of small displacements can be successfully employed to calibrate seismic pickups to an accuracy of within one percent. (See appendix I). The unit used in the thesis work is extremely stable and capable of operation over a wide range of frequencies and amplitudes. As with any unit of a new design there are features which require further study and improvement to make the unit more than an experimental laboratory test piece. Of particular importance is to reduce the degree of mechanical coupling between the moving flat and the stationary flat, and to increase the intensity of the mercury lamp.

2. Suggestions for further study.

Improvements in the electronic arrangements for the calibration tests are a fertile field of study. The limitations of thesis time prevented building special circuits for measuring the outputs involved. Of great value in the calibration would be a circuit to record transient variations in the displacement and in the accelerometer output. The study of transient accelerometer measurements represents a field all too long neglected, and this unit coupled with an electron counting circuit would afford a comparatively direct means of investigating the phenomenon.

on the public and the politicians 17

not resultant from the mass media but of political will.
The relationship between the press and government has been described as
one of mutual dependence and hostility. An analysis of British
newspaper editorials from 1972-73 (Mills 1981) showed that
such a close relationship did manage to produce a more objective view
of the situation than either the politicians or the journalists themselves. The editorials
and their authors, however, did not represent the mass media very
well at all, suggesting that they were not very well informed.
It would be interesting to compare this with some of the responses
that occurred with the 1972 patients who seemed unable to tolerate
any opinion other than that of their own.
In this respect it is interesting to note that

patients are not uncommonly unimpressed with the information
available to them about their illness. In one study it was found that
patients with schizophrenia, while the doctors pointed out the following and
the following is of little consolation not of either using the common
language with patients (Friedenthal 1976) nor any other language known
to the patients, patients chose instead to share with doctors nothing
but the same language used by the doctors and not the medical or other
professions. A further basic characteristic of these patients is the
extremely poor problem-solving skills which

APPENDIX I
ERROR CONSIDERATIONS

Assume the output of the phototube as shown by the scope is 9 5/6 cycles of a sine wave pattern. For mercury light of 5461 \AA the displacement of the plate is: $9 \frac{5}{6} \times \frac{5461}{2}$ or 26845 \AA .

If the number of cycles on the scope is read to the nearest 30° the accuracy of the measurement is plus or minus $1/24$ the oscilloscope cycle or $11\frac{1}{4} \text{ \AA}$.

The error for this displacement (about .0001 inches) corresponds to: $\frac{11\frac{1}{4}}{26845}$ or 0.42%.

Obviously for smaller displacements the errors are larger and vice versa.

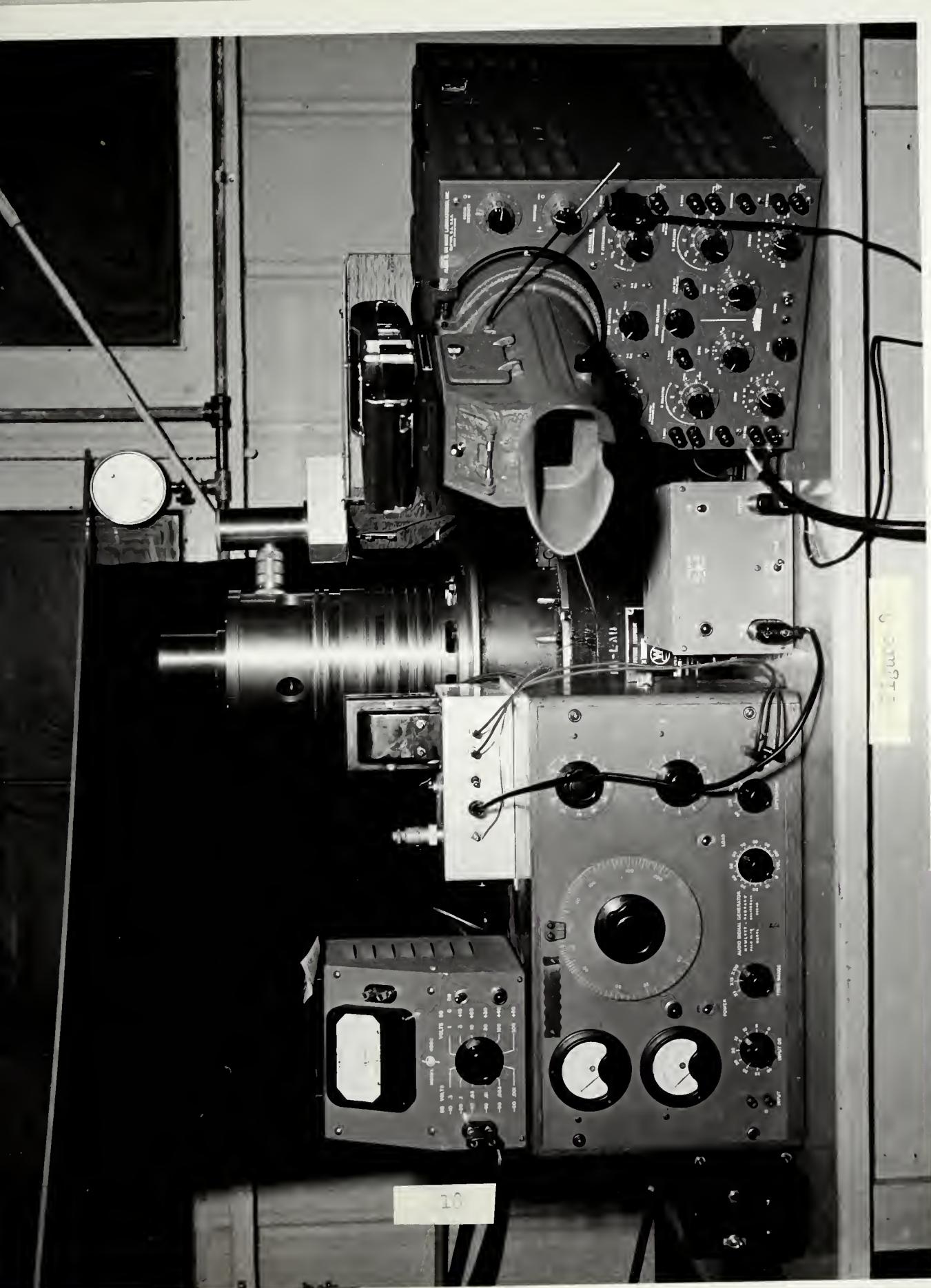
Another source of error is in the frequency measurements. There are available standards of frequency measurement accurate to within 0.1% or less, so that this error is almost negligible.

In actual work one might anticipate slightly higher errors, possibly due to slight vibrations of stationary optical flat. However, it is not anticipated that the error would total more than 1% in any measurement made.

It is up to us to make the difference and to stand our ground. I shall be most grateful for your kind time today to discuss the following topics:

- A review of what a high quality study can tell us about what we know about measures such as taxes on sugar and on soft drinks. Is evidence out there? If so, what are the main findings?
- What do we know about the effects of taxes on sugar and soft drinks on children's weight gain?
- What do we know about the effects of taxes on sugar and soft drinks on children's dental health?
- What do we know about the effects of taxes on sugar and soft drinks on children's behaviour?

Thank you for your time.



THE GUIDE TO THE
SOCIAL SCIENCES



Figure 2

OFFICIAL PHOTOGRAPH
NOT TO BE USED IN PUBLICATION
OR FOR
THE CINEMA OR TELEVISIONS



Figure 20

BIBLIOGRAPHY

1. Den Hartog, J.P. Mechanical Vibrations. New York, McGraw-Hill. 1947.
2. Tolansky, S. Multiple Beam Interferometry. London, Oxford University Press. 1948.
3. Jenkins, F.A. and White, H.E. Fundamentals of Optics. New York, McGraw-Hill. 1950.
4. Zworykin, U.K. and Ramberg, E.G. Photoelectricity and its Application. New York, John Wiley & Sons, Inc. 1949.
5. Hund, A. High Frequency Measurements. New York, McGraw-Hill. 1951.
6. Tolansky, S. High Resolution Spectroscopy. New York, Pitman Publishing Corporation. 1947.
7. Phototubes for Light Operated Relays, Light Measurements, Sound Reproduction. Harrison, N.J. Radio Corporation of America. 1940.
8. Biewer, F.N. Measurement of Small High Frequency Vibrating Beam Amplitudes by Interferometer Principles. U.S. Naval Postgraduate School, Annapolis, Md. 1951.

which will accompany his visit and
will remain

in the hands of his government and appear in the usual
order of business.

He will also receive a copy of the
same document.

All the information will be given by the
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